nor will the ore have to be crushed or reground to the same degree of fineness as at present found necessary with sulpho-telluride and other refractory ores.

15. It should be remembered that, as a rule, metallic oxides are not saved by oil, although partial exceptions occur, as in the case of atacamite, oxide of copper, and cassiterite. Sulphide minerals, on the contrary, are almost invariably retained with completeness, the most notable exception being the incomplete removal of "blende." Hence, in the installation of oil-concentration plant, care should be taken to avoid undue oxidation at any stage in the previous reduction operations, in order to prevent the possible formation of oxide films on the surfaces of the sulphides present in the ore. It is for this reason also that tailings and slimes sent for trial should be taken as "running" samples, and despatched hermetically sealed.

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## THE GODBE AGITATION METHOD OF LEACHING.*

This is a new method, recently patented by Mr. Ernest Godbe, of Salt Lake, Utah, for leaching fine or slimy ores by agitation and the separation of the solution from the ore.

In the case of most ores, especially tellurides and sulphides, the finer they are pulverised the higher is the extraction by the cyanide-solution; but it is well known that very fine or talcy ores cannot be successfully leached by percolation, and this is the class of material the Godbe process is more particularly designed to treat. It consists of a combination of agitation and upward percolation simultaneously in the same vat. The pulp is stirred with a cyanide-solution containing lime in a circular vat, the diameter of which is not greater than the depth, and while being so stirred a stream of solution is introduced in the bottom from below a false filter-bottom, and rises up through the agitated and suspended ore, and overflows at the top perfectly clear and free from slime. To do this the miller or stirrer is placed close to the bottom of the vat, and does not revolve fast enough to throw the slime up to the surface of the charge, but just sufficient to keep the entire mass well up in suspension and flowing around in the tank, and at the same time always leave a few inches of perfectly clear solution at the top. The solution in its upward course comes into intimate contact with every particle of slime, as the latter is constantly changing its position in the tank and rises above the mass of slime into the clear-solution zone at the top, from whence it overflows perfectly clear and ready for precipitation.

During the period of dissolving the gold the speed of the stirrer is increased so that the entire charge is in thorough agitation, and at this stage compressed air can be blown in to hasten the dissolution of the gold if the ore requires it. After the dissolution has taken place the gold-bearing solution is washed out by displacement with weak precipitated solution until all the gold has been washed out of the charge, and in turn the weak precipitated cyanide-solution is displaced with water, when a plug is drawn and the charge allowed to run out into the tailings-dam. Each displacement operation washes out about 80 per cent. of the solution contained, so that it generally takes three displacements—two of solution and one of water—to recover practically all the gold-bearing solution from the charge. These displacements, however, take place very rapidly, two hours only being required for each one. The proportion of solution to ore varies according to the specific gravity of the slime, being from 1·2 to as high as five parts of solution to one of ore.

When used in connection with plate amalgamation no settling is required, as the water is withdrawn by displacement with the cyanide-solution. One important feature is that by using a large quantity of solution, which can be done—the upward percolation taking place so rapidly—a very much weaker solution can be used and still bring the proper or necessary amount of cyanide of potassium in contact with the metals to be dissolved, thereby reducing the loss of cyanide to a minimum, both as to the loss of the latter in attacking basis, as well as in the ordinary losses of solution. A warm solution greatly assists the operation mechanically, and, presumably, chemically.

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## STEMMING SHOT-HOLES.

The experiments made by the French Committee on Explosives were undertaken in accordance with instructions issued by the Minister of War, and extended to the following points: Comparison of the different methods of stemming in relation to the utilisation of the explosive; comparison of these methods from the point of view of the relative safety afforded thereby; comparison with reference to the danger of ignition through friction.

### The Utilisation of the Explosive.

These tests were made with Abel blocks, measurements being taken of the change in volume effected in the case of different methods of stemming under similar conditions. Although furnishing exact and comparable results, this method of testing presents different conditions to those obtaining in the practical use of explosives, more particularly as regards the friction between the stemming and the sides of the hole; nevertheless, the Committee considered it the best method available for the purpose in view.

The blocks employed were of the usual dimensions—viz., 28 cm. high, 25 cm. diameter, with a central bore 28 mm. in diameter, and varying in depth from 14 to 18 cm., according to the test. In order to increase the length of the stemming, the blocks in some instances were fitted with an iron tube screwed into the bore. This tube was 70 cm. long and 30 mm. inside diameter. The

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